

SCIENCE:

A WEEKLY RECORD OF SCIENTIFIC
PROGRESS.

JOHN MICHELS, Editor.

TERMS:		
PER YEAR,	- - - - -	FOUR DOLLARS
6 MONTHS,	- - - - -	TWO "
3 " "	- - - - -	ONE "
SINGLE COPIES,	- - - - -	TEN CENTS.

PUBLISHED AT

TRIBUNE BUILDING, NEW YORK.

P. O. Box 8838.

LONDON, ENGLAND, - - - - 150 LEADENHALL ST.

SATURDAY, NOVEMBER 26, 1881.

THE SATELLITES OF MARS.

The outer satellite of Mars was seen here on Nov. 15th, and by an observation of Nov. 20th its position was

WASHINGTON, M. T.

	<i>h.</i>	<i>m.</i>	<i>p.</i>	<i>s.</i>
1881. Nov. 20,	13	15	71°.7,	45".6.

This satellite is therefore near the predicted place. An hour later Phobos seemed to be visible, also near the computed position, but the sky had become a little thick and I could not be certain of seeing this satellite.

The planet will continue to approach the earth until December 21, and the satellites will become brighter. It is possible, therefore, that they may be observed for nearly two months during the present opposition.

A. HALL.

WASHINGTON, D. C., Nov. 22, 1881.

THEORY OF THE MOON'S MOTION.*

About a year ago the Vice-President of the Physical Section of our chief scientific association remarked, in his farewell address: "there are many subjects in astronomy that need investigation, but in most cases the labor required is very great, and the completion of the work would occupy a long time. * * * The lunar theory has been a vexed question for the last two centuries, and may remain so for a long time to come." If persistent, painstaking, and conscientious effort have aught to do with such a matter, we must add to the list of distinguished lunar theorists, including Plana, Damoiseau, Hansen, and Delaunay, the name of Stockwell. We cannot say that his researches have yet met with that notice to which they are perhaps rightly entitled. Mr. Stockwell has published a num-

ber of monographs on many points connected with the lunar theory during the last six or seven years; and his works show great familiarity with, and expertness in, the involved computations of this sort of astronomical research.

If we may judge from the appearance of the pamphlet before us, Mr. Stockwell has now quite terminated his lunar investigations, and intends to complete the publication of his finished theory of the moon's motion at some early date. In his Introduction he has sketched the early historic development of the question with that explicitness which we should expect rather to have seen in some thorough elementary text-book; strangely, he devotes twice as much space to the ante-Newtonian aspect of the problem as to the most remarkable developments of the mathematical theory which have occurred since his time. He makes no mention of Damoiseau, who takes high rank not only among pure lunar theorists, but among the constructors of tables of the moon. His tables are well known to have been the first ever constructed from pure theory.

Though the age of the great lunar investigators is now gone, there are some very surprising results of Mr. Stockwell's "new method of analysis" to which the attention of the few theorists now working at the moon's motion might well be directed. He instances several comparisons of the values of his co-efficients with those obtained by Delaunay in his very refined development; in one case he obtains, by a rapidly-converging series of four terms, a result identically the same with that of Delaunay's series of seven terms; and remarks, "the four terms of my development are more accurate than the seven terms of Delaunay's, since the seventh term of the latter series is thirty times greater than the fourth term of the former." There is nothing new in the fact that the sum of a very small number of terms should come out equal to a very large series, but if theorists can be brought to acknowledge the essential accuracy of the "new method," Mr. Stockwell must no doubt be credited with effecting an enormous advance in mathematical astronomy. Mr. Stockwell has shown satisfactorily to himself the correctness and value of his method, and the facility of its application—he must now address himself to the equally difficult task of making others see it in the same light.

It seems a wholesale assertion on the part of Mr. Stockwell that there are "several terms of considerable magnitude in the theories of La Place, Plana, Pontécoulant and Delaunay, which are not functions of the disturbing force;" and we should, at first blush, be inclined to place much confidence in his demonstration that the general integral assumes the indeterminate form in special cases which occur in those theories. It is certainly a most important oversight, and leads us to believe that the lunar theorists who followed La Place would have done much better to have built up theories of their own with entire independence of what anyone else had done. It is a remarkable fact if this discovery has been left for Mr. Stockwell to make. He concludes: "if the computations of the present work are correct, astronomers have carried their approximations to terms of the *fifth*,

* John N. Stockwell, Ph. D. (Introductory.)